

TMP9R01-SP Plastic Neutron Displacement Damage (NDD) Characterization Report



ABSTRACT

This report presents the effect of neutron displacement damage (NDD) on the Texas Instruments TMP9R01-SP plastic. The TMP9R01-SP plastic showed a strong degree of hardness to neutron irradiation up to fluence level $1 \times 10^{13} \text{ n/cm}^2$.

The neutron irradiation test is a destructive test. Test procedure follows MIL-STD-883 method 1017 as guidance. The purpose of this test is to determine the device susceptibility to non-ionizing energy loss (NIEL) degradation. Objectives of the test are to detect and measure the degradation of critical device parameters as a function of neutron fluence and to determine if these parameters are within specified limits after exposure to a specified level of neutron fluence.

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1 Device Information

1.1 Product Description

The TMP9R01-SP device is a radiation-hardened, high-accuracy, low-power remote temperature sensor monitor with a built-in local temperature sensor. The remote temperature sensors are typically low-cost discrete NPN or PNP transistors, or substrate thermal transistors or diodes that are integral parts of microprocessors, analog-to-digital converters (ADCs), digital-to-analog converters (DACs), microcontrollers, or field-programmable gate arrays (FPGAs). Temperature is represented as a 12-bit digital code for both local and remote sensors, giving a resolution of 0.0625°C. The two-wire serial interface accepts the SMBus communication protocol with up to nine different pin-programmable addresses. Advanced features such as series resistance cancellation, programmable non-ideality factor (η -factor), programmable offset, programmable temperature limits, and a programmable digital filter are combined to provide a robust thermal monitoring design with improved accuracy and noise immunity. The TMP9R01-SP is designed for multi-location, high-accuracy temperature measurements in a variety of distributed telemetry applications. The integrated local and remote temperature sensors simplify spacecraft housekeeping activities by providing a simple way of measuring temperature gradients. The device is specified for operation over a supply voltage range of 1.7V to 3.6V, and a temperature range of –55°C to 125°C.

1.2 Device Details

Table 1-1 lists the device information used in the initial NDD characterization.

Table 1-1. Device and Exposure Details

NDD Exposure Details	
TI Device	TMP9R01-SP
TI Part Name	5962R1721802PYE
Package	10-pin DGS (VSSOP)
Technology	LBC8LV
Lot Number / Date Code	5081957 / 2507
Sample Quantity	12+2 control unit
Exposure Facility	VPT Rad
Neutron Fluence (1MeV equivalent) Level	1×10^{12} , 5×10^{12} , 1×10^{13} n/cm ²
Irradiation Temperature	Ambient room temperature (25°C)

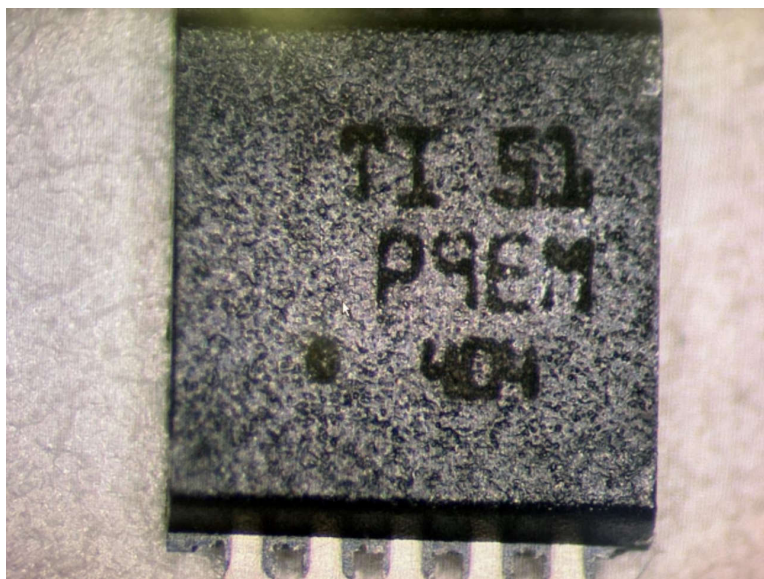


Figure 1-1. TMP9R01-SP Device

2 Total Dose Test Setup

2.1 Test Overview

General test procedures adhere to MIL-STD-883, Method 1017 as a guide for neutron irradiation. The TMP9R01-SP was electrically tested using the production automated test equipment (ATE) program at an ambient room temperature of 25°C before and after neutron irradiation.

2.2 Test Facility

VPT Rad performs all neutron displacement damage irradiations in a low-enriched, open-pool, water moderated, thermal neutron reactor. VPT Rad uses flat-plate type fuel, and having a maximum thermal energy output of up to 1MW. The fast neutron irradiator (FNI) faces one side of the reactor core, the design produces a geometrical planar beam of fast neutrons that is approximately uniform over an area of 12in × 20in. Lead and thermal neutron absorbing compounds are combined to filter out both fission gammas and thermal neutrons. The ratio of fast-to-thermal neutrons is approximately 400:1, with a gamma exposure of less than 150rad(Si) for a 1E12 n/cm² (1MeV Si equivalent) exposure. The FNI can accommodate a sample or samples with size up to 30cm in diameter and 15 cm thick including packaging materials. The minimum neutron fluence rate is 1E6 n/cm²-s. The maximum neutron fluence rate is approximately 1E11 n/cm²-s. Both values are 1MeV Si equivalent. The neutron fluence rate is determined using the previously measured neutron radiation field for the FNI, performed in accordance with ASTM standards (ASTM F1190), and correlated to the measured reactor power level. The neutron dose is timed to meet the customer-specified fluence for the irradiation. Neutron dosimetry meeting ASTM standards (ASTM E265) is used to track and verify irradiations meet the required minimum. The facility retains source-suitability with the Defense Logistics Agency (DLA) Laboratory Suitability Program for ASTM Test Method 1017. The DUTS are typically irradiation in an unbiased condition as per TM1017. If bias conditions are required, the conditions can be maintained through dry thimbles connected to the irradiation volume.

2.3 Test Setup Details

Devices were irradiated at three fluence levels in unbiased conditions: 1.0×10^{12} n/cm², 5.0×10^{12} n/cm² and 1.0×10^{13} n/cm². See the details in the following table.

2.4 Test Configuration and Condition

Table 2-1. Neutron Irradiation Conditions

GROUP	SAMPLE QTY	NEUTRON FLUENCE (n/cm ²)	BIAS
A	4	1.0×10^{12}	Unbiased
B	4	5.0×10^{12}	Unbiased
C	4	1.0×10^{13}	Unbiased
Control Units	2	N/A	N/A

3 NDD Characterization Test Results

3.1 NDD Characterization Summary

The results show that all devices were fully functional and within specification limits. A sample size of twelve units was exposed for neutron irradiation and an additional two unirradiated control units were used as correlation. Overall, the TMP9R01-SP showed a strong degree of hardness to neutron irradiation up to fluence level 1×10^{13} n/cm². The measurements taken post-irradiation for each sample set showed a marginal shift for most parameters at each fluence level.

The parameters that did show a greater degree of change between pre- and post-irradiation were still within the electrical performance characteristics specified in the datasheet electrical parameters. See [Table 3-1](#) for electrical parameters and associated tests. Electrical testing is done for pre- and post-neutron irradiation by ATE. ATE electrical test is done at an ambient room temperature of 25°C.

See [Appendix A](#) for NDD report up to 1×10^{13} n/cm².

3.2 Datasheet Electrical Parameter Characteristics

V+ = 1.7V to 3.6V, unless otherwise noted, TA = -55°C to 125°C, unless otherwise noted.

Table 3-1. Datasheet Electrical Parameter Characteristics

PARAMETER			TEST CONDITIONS	SUB-GROUP	MIN	TYP	MAX	UNIT	TEST NUMBERS
TEMPERATURE MEASUREMENT									
T _{LOCAL}	Local Temperature Sensor Accuracy			1, 2, 3	-2	±0.5	2	°C	4.24, 4.26, 4.27
T _{REMOTE}	Remote Temperature Sensor Accuracy			1, 2, 3	-1.5	±0.125	1.5	°C	4.10, 4.11, 4.12, 4.14, 4.15, 4.17, 4.18
	Local Temperature Error Supply Sensitivity		V+ = 1.7V to 3.6V	1, 2, 3	-0.3	±0.1	0.3	°C/V	4.29
	Remote Temperature Error Supply Sensitivity		V+ = 1.7V to 3.6V	1, 2, 3	-0.3	±0.1	0.3	°C/V	4.29
	Temperature Resolution (Local and Remote)				0.0625			°C	
	ADC Conversion Time		One-shot mode, per channel (local or remote)	9, 10, 11		15	17	ms	4.30
	ADC Resolution			4, 5, 6	12			Bits	
	Remote Sensor Source Current	High	Series	1, 2, 3	85	120	155	µA	4.4
		Medium	Resistance 1kΩ	1, 2, 3	30	45	60		4.2
		Low	(max)	1, 2, 3	5	7.5	10		4.0
η	Remote Transistor Ideality Factor		TMP9R01-SP/ TMP9R01-SEP Optimized Ideality Factor		1.008				
SERIAL INTERFACE (SCL, SDA)									
V _{IH}	High-level Input Voltage			1, 2, 3	1.4			V	
V _{IL}	Low-level Input Voltage			1, 2, 3			0.45	V	2.4, 2.5, 2.6
	Hysteresis					200		mV	
	SDA Output-low sink current			1, 2, 3	6			mA	
V _{OL}	Low-level output voltage		I _O = -6 mA	1, 2, 3		0.15	0.4	V	

Table 3-1. Datasheet Electrical Parameter Characteristics (continued)

PARAMETER		TEST CONDITIONS	SUB-GROUP	MIN	TYP	MAX	UNIT	TEST NUMBERS
	Serial Bus Input Leakage Current	$0V \leq V_{IN} \leq 3.6V$	1, 2, 3	-1		1	μA	
	Serial Bus Input Capacitance	SCL	1, 2, 3		3		pF	
	Serial Bus Input Capacitance	SDA	1, 2, 3		4.5		pF	
	Serial Bus Clock Frequency		9, 10, 11			2.17	MHz	
	Serial Bus Timeout		9, 10, 11	20	25	30	ms	2.24
DIGITAL INPUTS (Ao, A1)								
V_{IH}	High-level Input Voltage		1, 2, 3	$0.9x(V+)$		$(V+)+0.3$	V	
V_{IL}	Low-level Input Voltage		1, 2, 3	-0.3		$0.1x(V+)$	V	
	Input Leakage Current	$0V \leq V_{IN} \leq 3.6V$	1, 2, 3	-1		1	μA	
	Input Capacitance				2.5		pF	
DIGITAL OUTPUTS (THERM1, ALERT/THERM2)								
	Output-low Sink Current		1, 2, 3	6			mA	
V_{OL}	Low-level output voltage	$I_O = -6mA$	1, 2, 3		0.15	0.4	V	
I_{OH}	High-level output leakage current	$V_O = V+$	1, 2, 3			1	μA	
POWER SUPPLY								
$V+$	Specified Supply voltage range		1, 2, 3	1.7		3.6	V	
I_Q	Quiescent current	Active conversion, local sensor	1, 2, 3		240	375	μA	1.12, 5.2
		Active conversion, remote sensors	1, 2, 3		400	600		1.13, 5.3
		Standby mode (between conversions)	1, 2, 3		15	35		1.11, 5.1
		Shutdown mode, serial bus inactive	1, 2, 3		3	8		1.10, 5.0
		Shutdown mode, serial bus active, $f_s = 400kHz$			90			
		Shutdown mode, serial bus active, $f_s = 2.17MHz$			350			
POR	Power-on reset threshold	Rising edge	1, 2, 3		1.2	1.55	V	

4 Applicable and Reference Documents

4.1 Applicable Documents

- Texas Instruments, [TMP9R01-SP QML Class-P Radiation Hardness Assured \(RHA\), I²C Digital Temperature Sensor with Remote and Local \(On-Chip\) Temperature Sensing](#), datasheet.
- Texas Instruments, [TMP9R01-SP Evaluation Module User's Guide](#), user's guide.

4.2 Reference Documents

Texas Instruments neutron irradiation test follow the guideline from MIL-STD-883 TM 1017. The document is available in the Defense Logistic Agency's website.

A Appendix: NDD Report Data

This appendix contains the NDD report data.

Note that the absence of identifiers in a parameter name indicates that the identifier is not applicable. For instance, this test does not have the device driving an external load, and thus no load current is specified.

Delta Threshold 10.00%

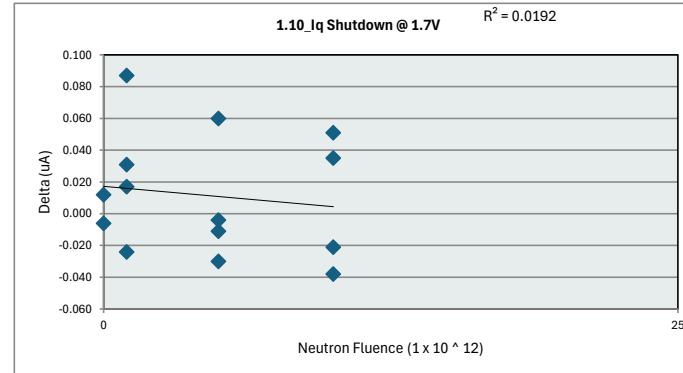
NDD Report TMP9R01-SP

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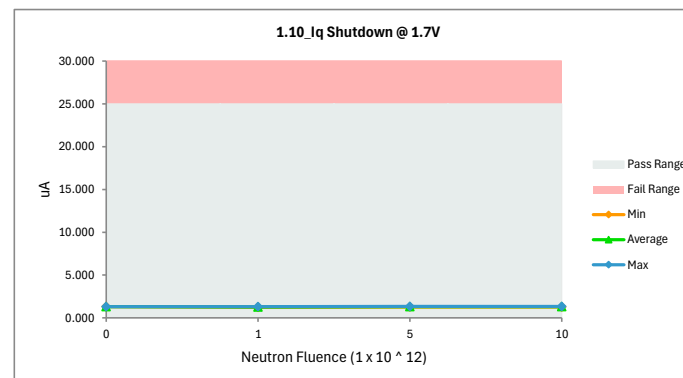
1.10_Iq Shutdown @ 1.7V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	25	25
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	1.273	1.256	0.017
1	2	1.314	1.283	0.031
1	3	1.314	1.227	0.087
1	4	1.281	1.305	-0.024
5	5	1.306	1.336	-0.030
5	6	1.308	1.312	-0.004
5	7	1.282	1.293	-0.011
5	8	1.327	1.267	0.060
10	9	1.347	1.312	0.035
10	10	1.308	1.257	0.051
10	11	1.297	1.335	-0.038
10	12	1.265	1.286	-0.021
0	192	1.304	1.310	-0.006
0	193	1.325	1.313	0.012
Max		1.347	1.336	0.087
Average		1.304	1.292	0.011
Min		1.265	1.227	-0.038
Std Dev		0.023	0.032	0.037



1.10_Iq Shutdown @ 1.7V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	25	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	1.310	1.227	1.267	1.257
Average	1.312	1.268	1.302	1.298
Max	1.313	1.305	1.336	1.335
UL	25.000	25.000	25.000	25.000

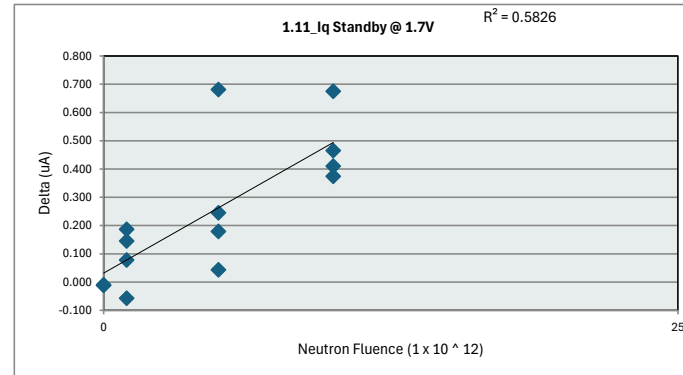


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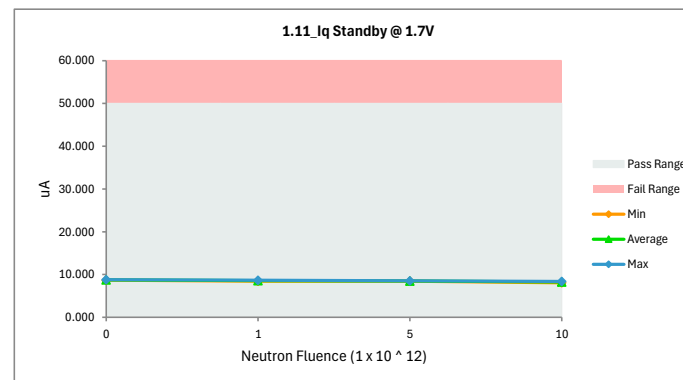
1.11_Iq Standby @ 1.7V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	50	50
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	8.600	8.455	0.145
1	2	8.776	8.589	0.187
1	3	8.682	8.604	0.078
1	4	8.599	8.656	-0.057
5	5	8.535	8.492	0.043
5	6	8.701	8.522	0.179
5	7	9.133	8.452	0.681
5	8	8.693	8.448	0.245
10	9	8.760	8.350	0.410
10	10	8.739	8.064	0.675
10	11	8.755	8.381	0.374
10	12	8.702	8.237	0.465
0	192	8.785	8.795	-0.010
0	193	8.675	8.687	-0.012
Max		9.133	8.795	0.681
Average		8.724	8.481	0.243
Min		8.535	8.064	-0.057
Std Dev		0.138	0.189	0.244



1.11_Iq Standby @ 1.7V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	50	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	8.687	8.455	8.448	8.064
Average	8.741	8.576	8.479	8.258
Max	8.795	8.656	8.522	8.381
UL	50.000	50.000	50.000	50.000

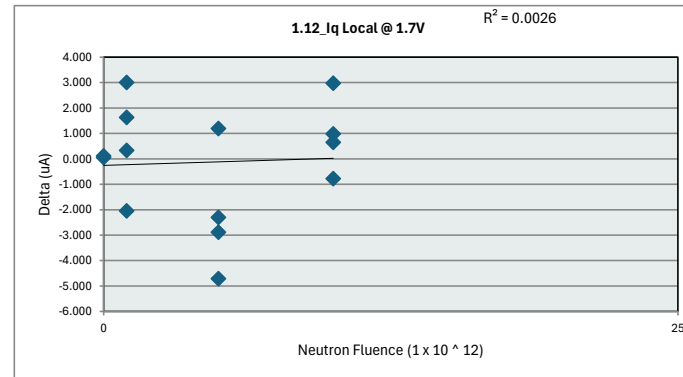


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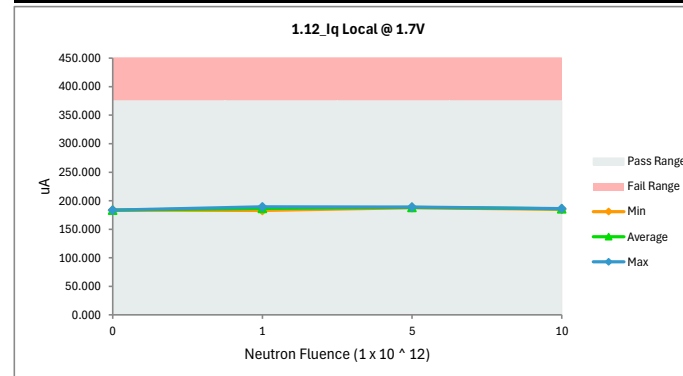
	1.12_Iq Local @ 1.7V	
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	375	375
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	185.614	187.662	-2.048
1	2	186.114	185.781	0.333
1	3	185.990	182.989	3.001
1	4	191.038	189.408	1.630
5	5	185.707	188.591	-2.884
5	6	189.328	188.135	1.193
5	7	184.063	188.780	-4.717
5	8	185.476	187.780	-2.304
10	9	186.588	185.938	0.650
10	10	189.270	186.296	2.974
10	11	187.233	186.253	0.980
10	12	184.187	184.963	-0.776
0	192	183.645	183.531	0.114
0	193	183.573	183.521	0.052
	Max	191.038	189.408	3.001
	Average	186.273	186.402	-0.129
	Min	183.573	182.989	-4.717
	Std Dev	2.270	2.092	2.217



	1.12_Iq Local @ 1.7V	
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Max Limit	375	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	183.521	182.989	187.780	184.963
Average	183.526	186.460	188.322	185.863
Max	183.531	189.408	188.780	186.296
UL	375.000	375.000	375.000	375.000

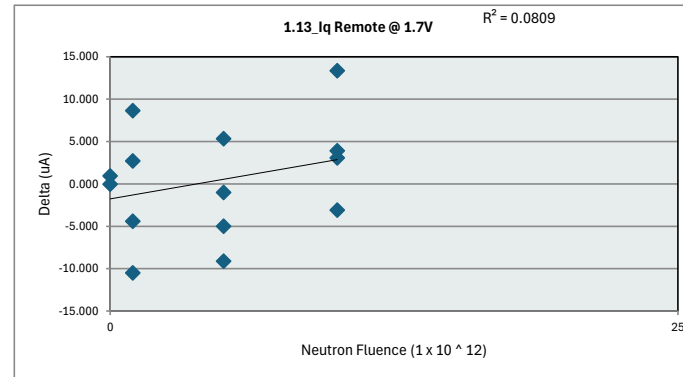


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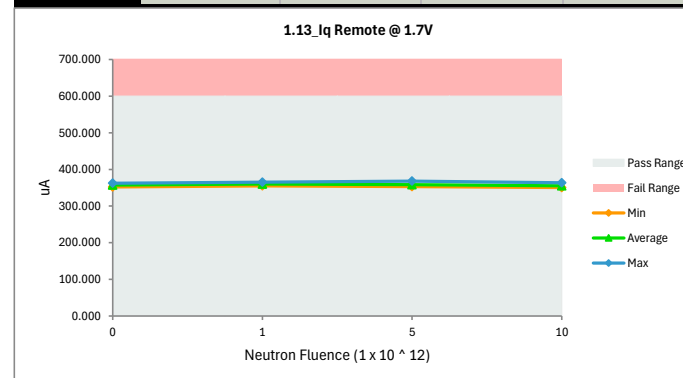
1.13_Iq Remote @ 1.7V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	600	600
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	354.852	365.355	-10.503
1	2	355.162	359.553	-4.391
1	3	357.746	355.031	2.715
1	4	369.342	360.693	8.649
5	5	358.992	353.649	5.343
5	6	357.936	358.930	-0.994
5	7	358.991	368.104	-9.113
5	8	348.042	353.028	-4.986
10	9	360.719	363.797	-3.078
10	10	358.753	354.841	3.912
10	11	363.923	350.569	13.354
10	12	355.275	352.197	3.078
0	192	362.328	362.356	-0.028
0	193	353.251	352.306	0.945
	Max	369.342	368.104	13.354
	Average	358.237	357.886	0.350
	Min	348.042	350.569	-10.503
	Std Dev	5.105	5.567	6.569



1.13_Iq Remote @ 1.7V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	600	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	352.306	355.031	353.028	350.569
Average	357.331	360.158	358.428	355.351
Max	362.356	365.355	368.104	363.797
UL	600.000	600.000	600.000	600.000

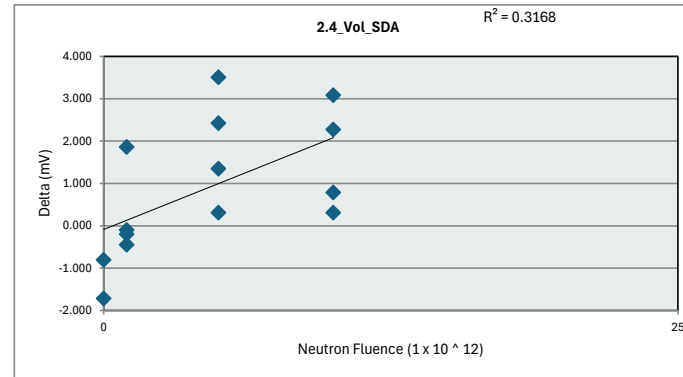


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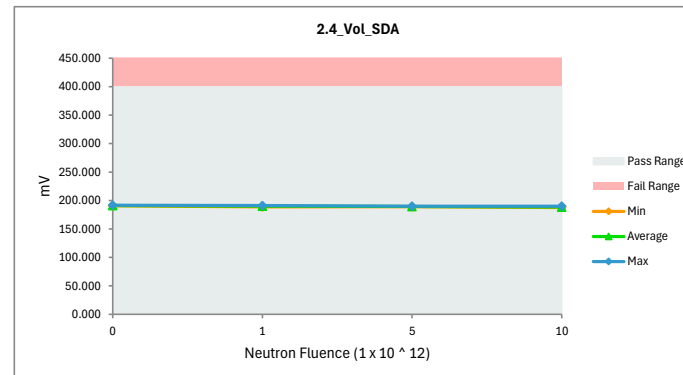
2.4_Vol_SDA		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	mV	mV
Max Limit	400	400
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	190.691	188.830	1.861
1	2	190.791	190.989	-0.198
1	3	189.493	189.941	-0.448
1	4	190.167	190.265	-0.098
5	5	191.515	189.092	2.423
5	6	190.915	189.566	1.349
5	7	193.512	190.003	3.509
5	8	189.605	189.292	0.313
10	9	188.756	187.968	0.788
10	10	190.316	190.003	0.313
10	11	191.864	188.780	3.084
10	12	189.929	187.656	2.273
0	192	188.968	190.682	-1.714
0	193	190.866	191.669	-0.803
Max		193.512	191.669	3.509
Average		190.528	189.624	0.904
Min		188.756	187.656	-1.714
Std Dev		1.242	1.120	1.553



2.4_Vol_SDA		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	400	mV
Min Limit	0	mV

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	190.682	188.830	189.092	187.656
Average	191.176	190.006	189.488	188.602
Max	191.669	190.989	190.003	190.003
UL	400.000	400.000	400.000	400.000

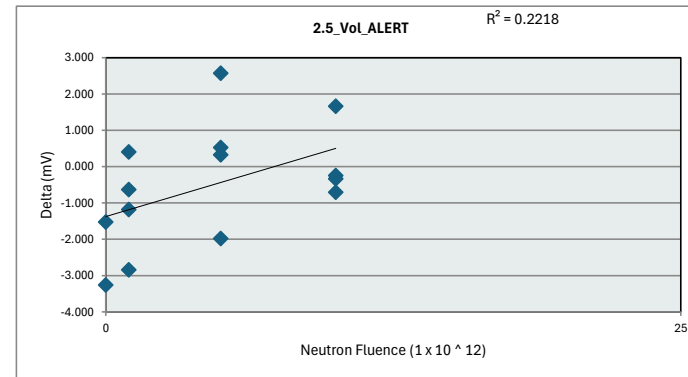


NDD Report

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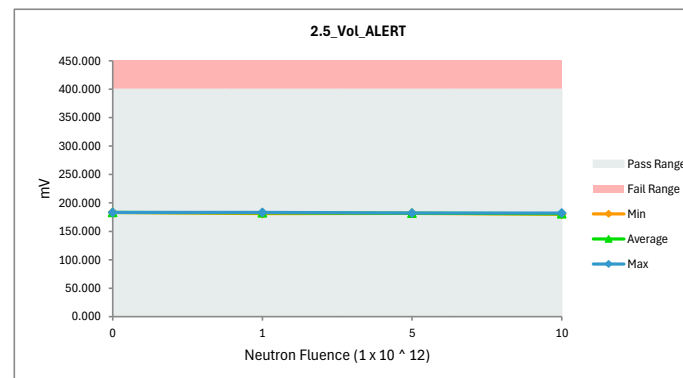
2.5_Vol_ALERT		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	mV	mV
Max Limit	400	400
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	181.664	181.262	0.402
1	2	182.375	183.009	-0.634
1	3	180.454	183.296	-2.842
1	4	181.077	182.261	-1.184
5	5	182.051	181.525	0.526
5	6	182.100	181.774	0.326
5	7	184.409	181.836	2.573
5	8	180.266	182.248	-1.982
10	9	180.279	180.614	-0.335
10	10	181.414	182.123	-0.709
10	11	182.637	180.976	1.661
10	12	179.755	180.002	-0.247
0	192	179.967	183.228	-3.261
0	193	181.764	183.290	-1.526
	Max	184.409	183.296	2.573
	Average	181.444	181.960	-0.517
	Min	179.755	180.002	-3.261
	Std Dev	1.269	1.030	1.609



2.5_Vol_ALERT		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	400	mV
Min Limit	0	mV

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	183.228	181.262	181.525	180.002
Average	183.259	182.457	181.846	180.929
Max	183.290	183.296	182.248	182.123
UL	400.000	400.000	400.000	400.000

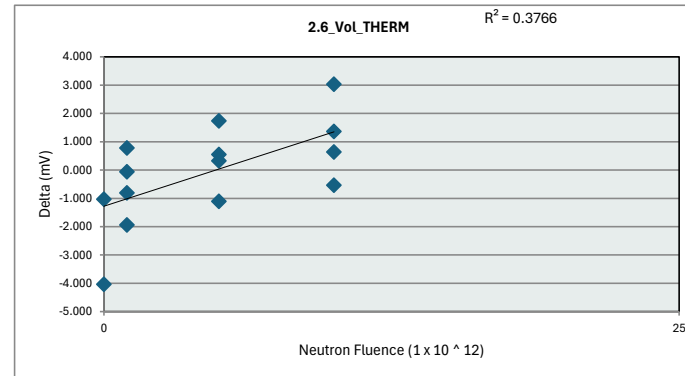


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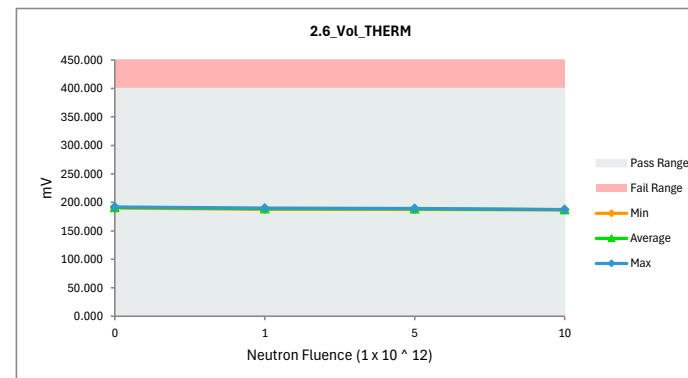
2.6_Vol_THERM		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	mV	mV
Max Limit	400	400
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	188.504	187.726	0.778
1	2	189.265	190.071	-0.806
1	3	187.606	189.547	-1.941
1	4	188.940	188.998	-0.058
5	5	189.402	187.663	1.739
5	6	189.040	188.487	0.553
5	7	189.539	189.210	0.329
5	8	187.556	188.662	-1.106
10	9	187.718	187.077	0.641
10	10	188.529	187.164	1.365
10	11	190.462	187.426	3.036
10	12	186.271	186.803	-0.532
0	192	187.868	191.905	-4.037
0	193	189.177	190.207	-1.030
Max		190.462	191.905	3.036
Average		188.563	188.639	-0.076
Min		186.271	186.803	-4.037
Std Dev		1.070	1.460	1.726



2.6_Vol_THERM		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	400	mV
Min Limit	0	mV

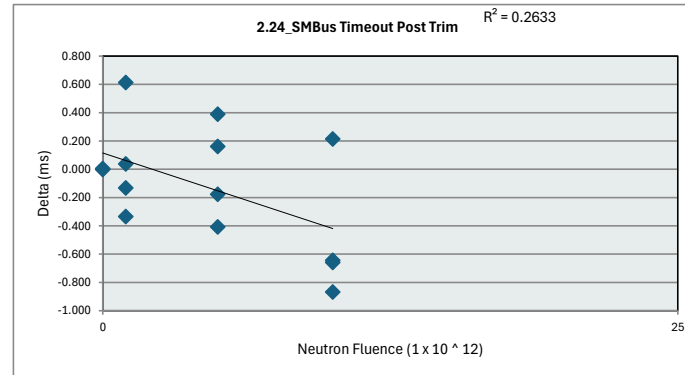
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	190.207	187.726	187.663	186.803
Average	191.056	189.086	188.506	187.118
Max	191.905	190.071	189.210	187.426
UL	400.000	400.000	400.000	400.000



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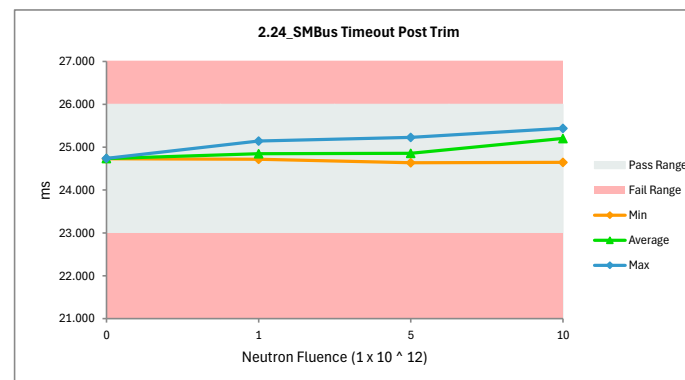
2.24_SMBus Timeout Post Trim		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	ms	ms
Max Limit	26	26
Min Limit	23	23

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	24.811	25.146	-0.335
1	2	24.585	24.718	-0.133
1	3	24.761	24.724	0.037
1	4	25.416	24.804	0.612
5	5	25.025	24.637	0.388
5	6	24.822	25.230	-0.408
5	7	24.538	24.715	-0.177
5	8	25.003	24.842	0.161
10	9	24.734	25.393	-0.659
10	10	24.573	25.441	-0.868
10	11	24.692	25.336	-0.644
10	12	24.860	24.647	0.213
0	192	24.728	24.730	-0.002
0	193	24.743	24.739	0.004
	Max	25.416	25.441	0.612
	Average	24.807	24.936	-0.129
	Min	24.538	24.637	-0.868
	Std Dev	0.227	0.301	0.420



2.24_SMBus Timeout Post Trim		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	26	ms
Min Limit	23	ms

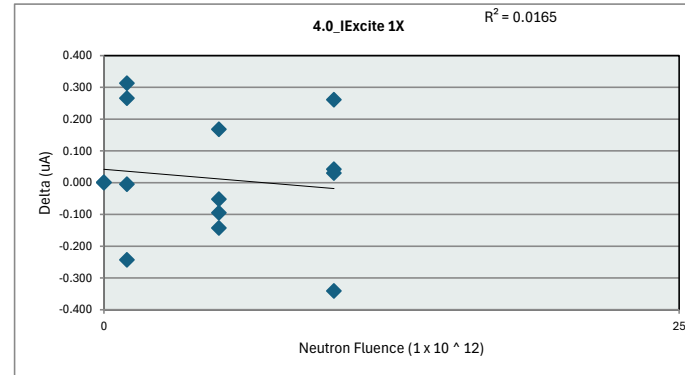
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	23.000	23.000	23.000	23.000
Min	24.730	24.718	24.637	24.647
Average	24.735	24.848	24.856	25.204
Max	24.739	25.146	25.230	25.441
UL	26.000	26.000	26.000	26.000



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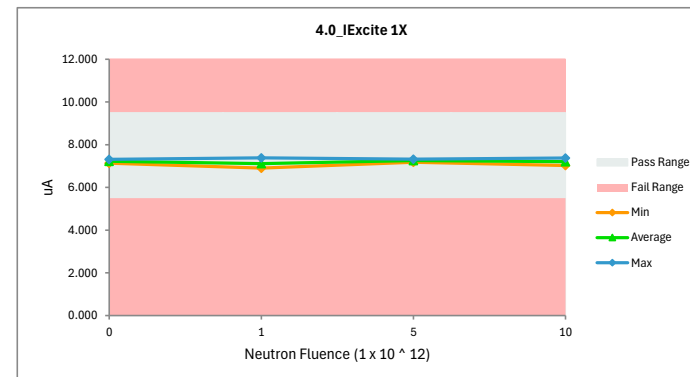
	4.0_IExcite 1X	
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	9.5	9.5
Min Limit	5.5	5.5

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	7.261	6.995	0.266
1	2	7.165	7.170	-0.005
1	3	7.217	6.904	0.313
1	4	7.141	7.384	-0.243
5	5	7.444	7.276	0.168
5	6	7.270	7.322	-0.052
5	7	7.163	7.258	-0.095
5	8	7.035	7.178	-0.143
10	9	7.264	7.222	0.042
10	10	7.285	7.024	0.261
10	11	7.228	7.198	0.030
10	12	7.036	7.377	-0.341
0	192	7.315	7.314	0.001
0	193	7.134	7.134	0.000
	Max	7.444	7.384	0.313
	Average	7.211	7.197	0.014
	Min	7.035	6.904	-0.341
	Std Dev	0.110	0.144	0.191



	4.0_IExcite 1X	
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	9.5	uA
Min Limit	5.5	uA

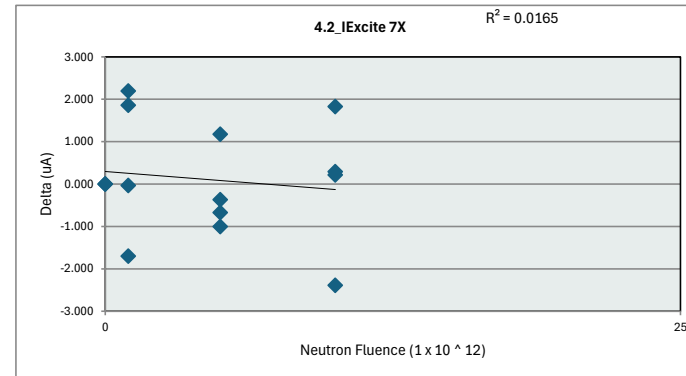
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	5.500	5.500	5.500	5.500
Min	7.134	6.904	7.178	7.024
Average	7.224	7.113	7.259	7.205
Max	7.314	7.384	7.322	7.377
UL	9.500	9.500	9.500	9.500



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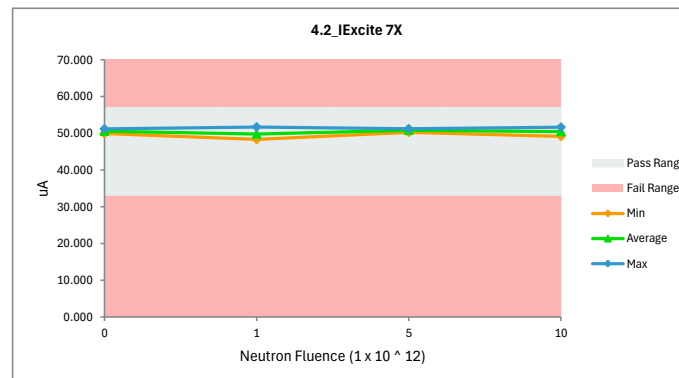
4.2_IExcite 7X		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	57	57
Min Limit	33	33

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	50.830	48.966	1.864
1	2	50.158	50.191	-0.033
1	3	50.522	48.325	2.197
1	4	49.989	51.687	-1.698
5	5	52.108	50.932	1.176
5	6	50.887	51.254	-0.367
5	7	50.138	50.806	-0.668
5	8	49.247	50.247	-1.000
10	9	50.847	50.554	0.293
10	10	50.996	49.168	1.828
10	11	50.599	50.383	0.216
10	12	49.255	51.642	-2.387
0	192	51.202	51.199	0.003
0	193	49.940	49.938	0.002
	Max	52.108	51.687	2.197
	Average	50.480	50.378	0.102
	Min	49.247	48.325	-2.387
	Std Dev	0.767	1.007	1.335



4.2_IExcite 7X		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	57	uA
Min Limit	33	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	33.000	33.000	33.000	33.000
Min	49.938	48.325	50.247	49.168
Average	50.569	49.792	50.810	50.437
Max	51.199	51.687	51.254	51.642
UL	57.000	57.000	57.000	57.000

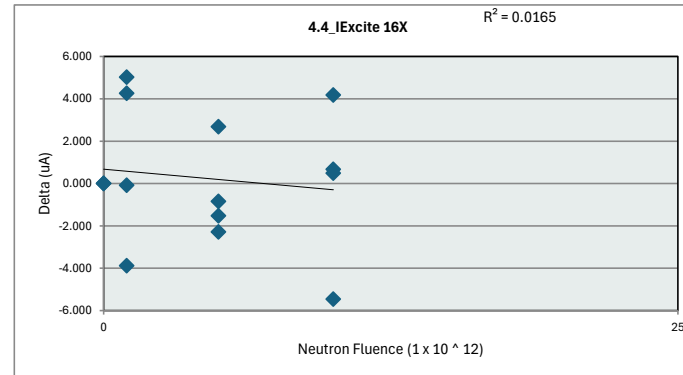


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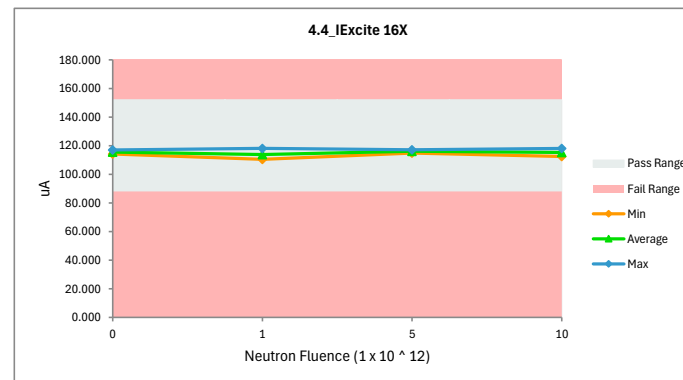
4.4_IExcite 16X		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	152	152
Min Limit	88	88

Neutron Fluence (1 x 10 ^ 12)	Serial #	nnd pre	NDD Post	Delta
1	1	116.184	111.922	4.262
1	2	114.646	114.722	-0.076
1	3	115.479	110.458	5.021
1	4	114.262	118.142	-3.880
5	5	119.104	116.416	2.688
5	6	116.313	117.152	-0.839
5	7	114.602	116.128	-1.526
5	8	112.564	114.850	-2.286
10	9	116.222	115.552	0.670
10	10	116.562	112.383	4.179
10	11	115.655	115.162	0.493
10	12	112.582	118.038	-5.456
0	192	117.034	117.026	0.008
0	193	114.148	114.143	0.005
	Max	119.104	118.142	5.021
	Average	115.383	115.150	0.233
	Min	112.564	110.458	-5.456
	Std Dev	1.754	2.302	3.052



4.4_IExcite 16X		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	152	uA
Min Limit	88	uA

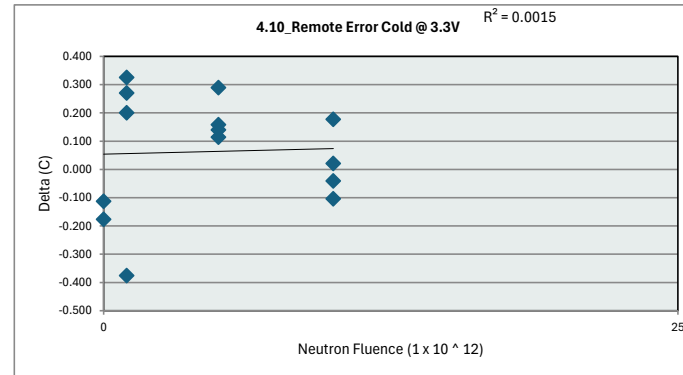
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	88.000	88.000	88.000	88.000
Min	114.143	110.458	114.850	112.383
Average	115.585	113.811	116.137	115.284
Max	117.026	118.142	117.152	118.038
UL	152.000	152.000	152.000	152.000



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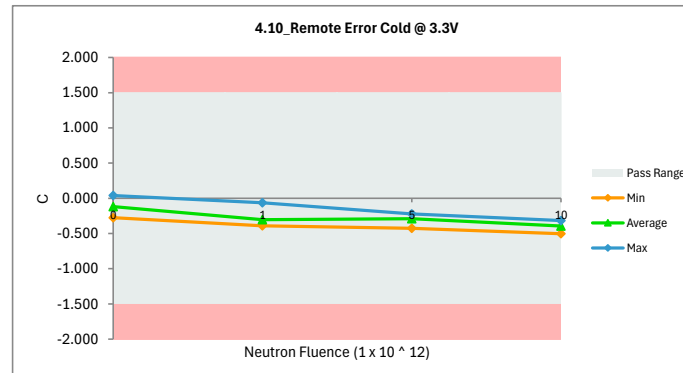
4.10_Remote Error Cold @ 3.3V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.065	-0.390	0.325
1	2	-0.096	-0.366	0.270
1	3	-0.190	-0.390	0.200
1	4	-0.440	-0.064	-0.376
5	5	-0.138	-0.278	0.140
5	6	-0.107	-0.221	0.114
5	7	-0.138	-0.427	0.289
5	8	-0.076	-0.234	0.158
10	9	-0.482	-0.503	0.021
10	10	-0.357	-0.316	-0.041
10	11	-0.482	-0.378	-0.104
10	12	-0.201	-0.378	0.177
0	192	-0.388	-0.275	-0.113
0	193	-0.138	0.039	-0.177
	Max	-0.065	0.039	0.325
	Average	-0.236	-0.299	0.063
	Min	-0.482	-0.503	-0.376
	Std Dev	0.158	0.145	0.203



4.10_Remote Error Cold @ 3.3V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	1.5	C
Min Limit	-1.5	C

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.275	-0.390	-0.427	-0.503
Average	-0.118	-0.303	-0.290	-0.394
Max	0.039	-0.064	-0.221	-0.316
UL	1.500	1.500	1.500	1.500



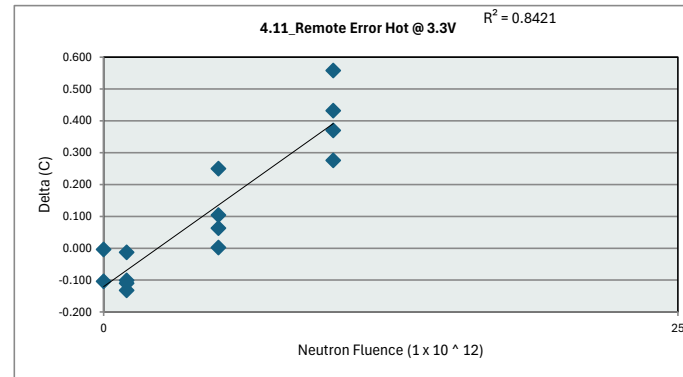
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4.11 Remote Error Hot @ 3.3V

Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

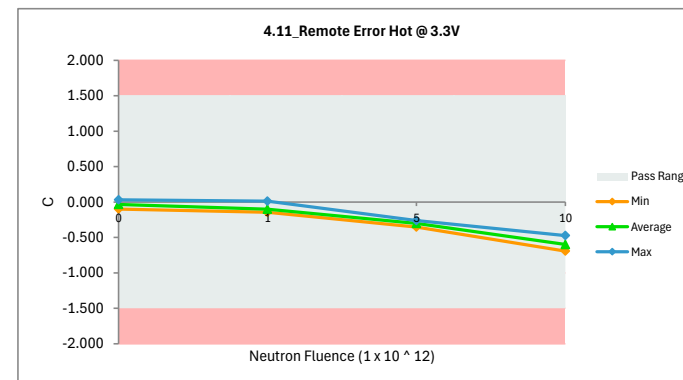
Neutron Fluence (1×10^{12})	Serial #	ndd pre	NDD Post	Delta
1	1	-0.120	0.012	-0.132
1	2	-0.245	-0.144	-0.101
1	3	-0.151	-0.138	-0.013
1	4	-0.245	-0.135	-0.110
5	5	-0.197	-0.260	0.063
5	6	-0.290	-0.292	0.002
5	7	-0.103	-0.353	0.250
5	8	-0.197	-0.301	0.104
10	9	-0.103	-0.473	0.370
10	10	-0.197	-0.629	0.432
10	11	-0.134	-0.692	0.558
10	12	-0.322	-0.598	0.276
0	192	-0.072	0.032	-0.104
0	193	-0.103	-0.099	-0.004
Max		-0.072	0.032	0.558
Average		-0.177	-0.291	0.114
Min		-0.322	-0.692	-0.132
Std Dev		0.077	0.234	0.225



4.11 Remote Error Hot @ 3.3V

Test Site	J2S
Tester	FETS36405
Test Number	EE131305
Max Limit	1.5 C
Min Limit	-1.5 C

Neutron Fluence (1×10^{12})	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.099	-0.144	-0.353	-0.692
Average	-0.034	-0.101	-0.302	-0.598
Max	0.032	0.012	-0.260	-0.473
UL	1.500	1.500	1.500	1.500



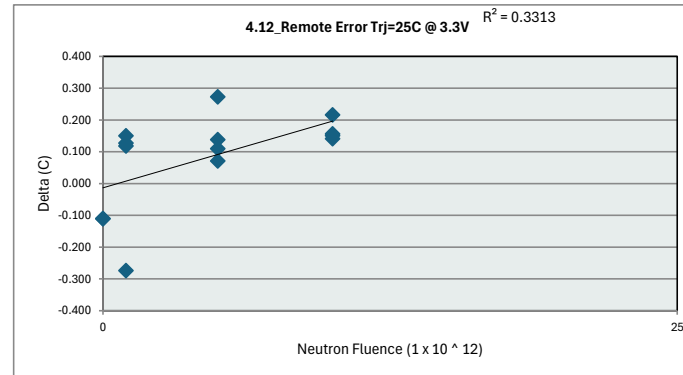
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4.12_Remote Error Trj=25C @ 3.3V

Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

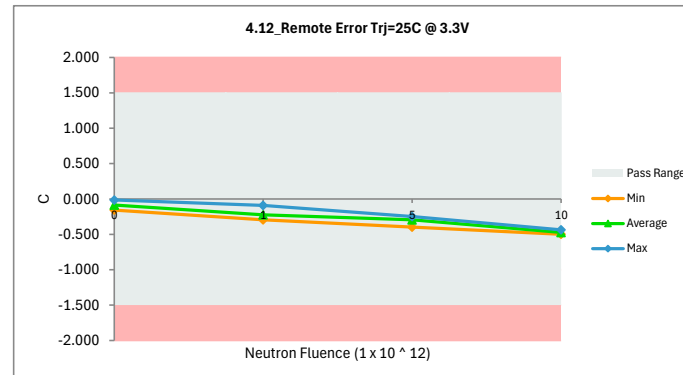
Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.086	-0.236	0.150
1	2	-0.153	-0.280	0.127
1	3	-0.175	-0.293	0.118
1	4	-0.365	-0.091	-0.274
5	5	-0.161	-0.271	0.110
5	6	-0.177	-0.248	0.071
5	7	-0.125	-0.398	0.273
5	8	-0.122	-0.260	0.138
10	9	-0.336	-0.492	0.156
10	10	-0.295	-0.436	0.141
10	11	-0.348	-0.499	0.151
10	12	-0.247	-0.463	0.216
0	192	-0.267	-0.157	-0.110
0	193	-0.125	-0.014	-0.111
Max		-0.086	-0.014	0.273
Average		-0.213	-0.296	0.083
Min		-0.365	-0.499	-0.274
Std Dev		0.095	0.148	0.147



4.12_Remote Error Trj=25C @

Test Site	J2S
Tester	FETS36405
Test Number	EE131305
Max Limit	1.5 C
Min Limit	-1.5 C

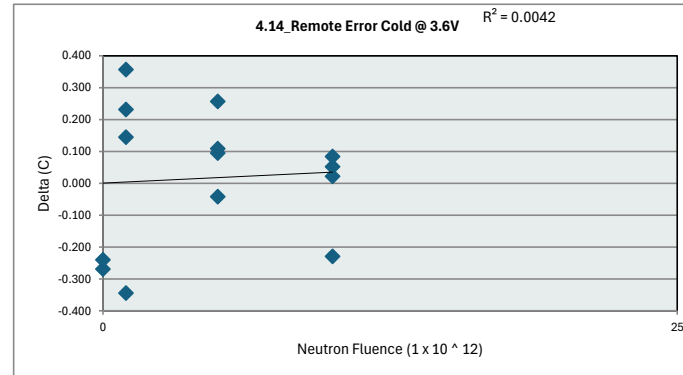
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.157	-0.293	-0.398	-0.499
Average	-0.085	-0.225	-0.294	-0.473
Max	-0.014	-0.091	-0.248	-0.436
UL	1.500	1.500	1.500	1.500



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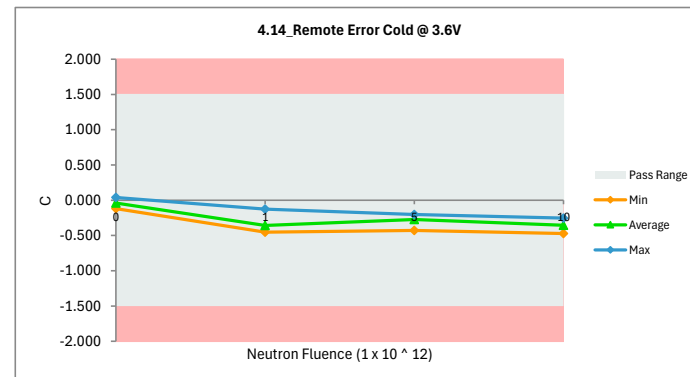
4.14_Remote Error Cold @ 3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.065	-0.422	0.357
1	2	-0.283	-0.428	0.145
1	3	-0.221	-0.453	0.232
1	4	-0.471	-0.127	-0.344
5	5	-0.138	-0.247	0.109
5	6	-0.263	-0.221	-0.042
5	7	-0.170	-0.427	0.257
5	8	-0.107	-0.202	0.095
10	9	-0.420	-0.472	0.052
10	10	-0.388	-0.410	0.022
10	11	-0.482	-0.253	-0.229
10	12	-0.201	-0.285	0.084
0	192	-0.388	-0.119	-0.269
0	193	-0.201	0.039	-0.240
Max		-0.065	0.039	0.357
Average		-0.271	-0.288	0.016
Min		-0.482	-0.472	-0.344
Std Dev		0.137	0.154	0.215



4.14_Remote Error Cold @ 3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	1.5	C
Min Limit	-1.5	C

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.119	-0.453	-0.427	-0.472
Average	-0.040	-0.358	-0.274	-0.355
Max	0.039	-0.127	-0.202	-0.253
UL	1.500	1.500	1.500	1.500

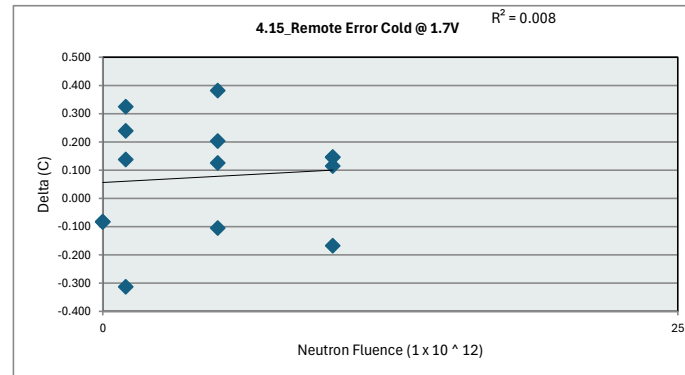


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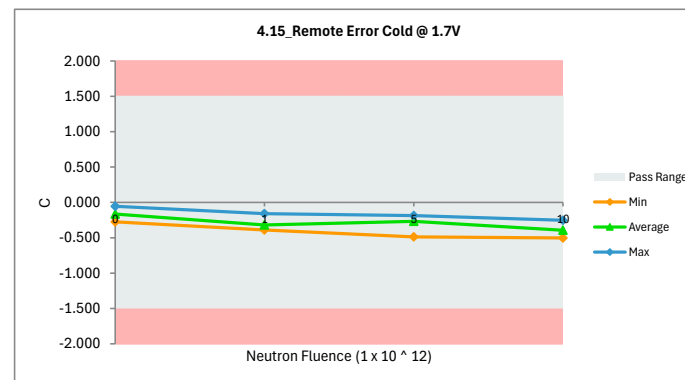
4.15_Remote Error Cold @ 1.7V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.065	-0.390	0.325
1	2	-0.127	-0.366	0.239
1	3	-0.221	-0.359	0.138
1	4	-0.471	-0.158	-0.313
5	5	0.018	-0.185	0.203
5	6	-0.295	-0.190	-0.105
5	7	-0.107	-0.489	0.382
5	8	-0.076	-0.202	0.126
10	9	-0.357	-0.503	0.146
10	10	-0.420	-0.253	-0.167
10	11	-0.357	-0.472	0.115
10	12	-0.201	-0.347	0.146
0	192	-0.357	-0.275	-0.082
0	193	-0.138	-0.055	-0.083
Max		0.018	-0.055	0.382
Average		-0.227	-0.303	0.076
Min		-0.471	-0.503	-0.313
Std Dev		0.150	0.137	0.198



4.15_Remote Error Cold @ 1.7V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	1.5	C
Min Limit	-1.5	C

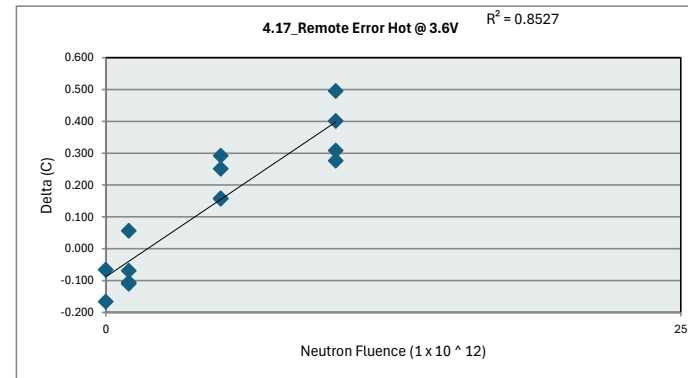
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.275	-0.390	-0.489	-0.503
Average	-0.165	-0.318	-0.267	-0.394
Max	-0.055	-0.158	-0.185	-0.253
UL	1.500	1.500	1.500	1.500



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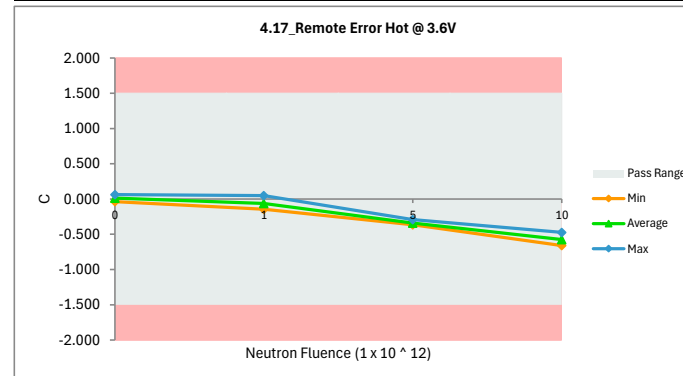
4.17_Remote Error Hot @ 3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	1.5	1.5
Min Limit	-1.5	-1.5

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.120	-0.051	-0.069
1	2	-0.088	-0.144	0.056
1	3	-0.057	0.049	-0.106
1	4	-0.213	-0.103	-0.110
5	5	-0.197	-0.354	0.157
5	6	-0.197	-0.355	0.158
5	7	-0.040	-0.291	0.251
5	8	-0.072	-0.364	0.292
10	9	-0.197	-0.473	0.276
10	10	-0.197	-0.598	0.401
10	11	-0.165	-0.660	0.495
10	12	-0.259	-0.567	0.308
0	192	-0.103	0.063	-0.166
0	193	-0.103	-0.037	-0.066
Max		-0.040	0.063	0.495
Average		-0.143	-0.277	0.134
Min		-0.259	-0.660	-0.166
Std Dev		0.068	0.243	0.212



4.17_Remote Error Hot @ 3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	1.5	C
Min Limit	-1.5	C

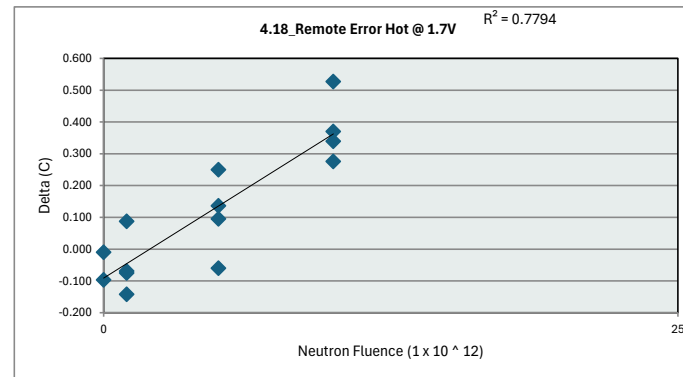
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.037	-0.144	-0.364	-0.660
Average	0.013	-0.062	-0.341	-0.575
Max	0.063	0.049	-0.291	-0.473
UL	1.500	1.500	1.500	1.500



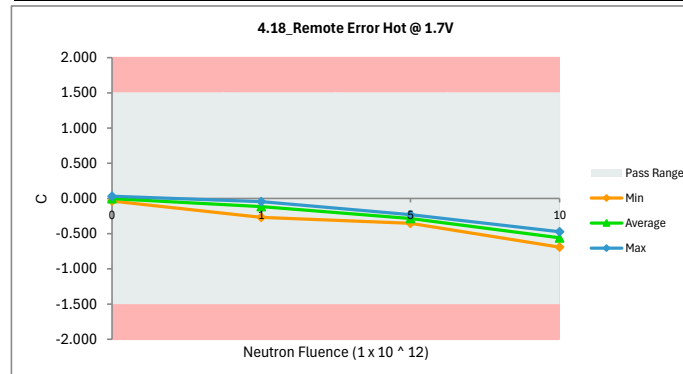
NDD Report

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4.18_Remote Error Hot @ 1.7V				
Test Site	J2S	J2S		
Tester	FETS36405	FETS36405		
Test Number	EE131305	EE131305		
Unit	C	C		
Max Limit	1.5	1.5		
Min Limit	-1.5	-1.5		
Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-0.120	-0.051	-0.069
1	2	-0.182	-0.269	0.087
1	3	-0.120	-0.045	-0.075
1	4	-0.245	-0.103	-0.142
5	5	-0.165	-0.260	0.095
5	6	-0.290	-0.230	-0.060
5	7	-0.103	-0.353	0.250
5	8	-0.165	-0.301	0.136
10	9	-0.103	-0.473	0.370
10	10	-0.259	-0.598	0.339
10	11	-0.165	-0.692	0.527
10	12	-0.197	-0.473	0.276
0	192	0.022	0.032	-0.010
0	193	-0.134	-0.037	-0.097
Max		0.022	0.032	0.527
Average		-0.159	-0.275	0.116
Min		-0.290	-0.692	-0.142
Std Dev		0.078	0.223	0.207



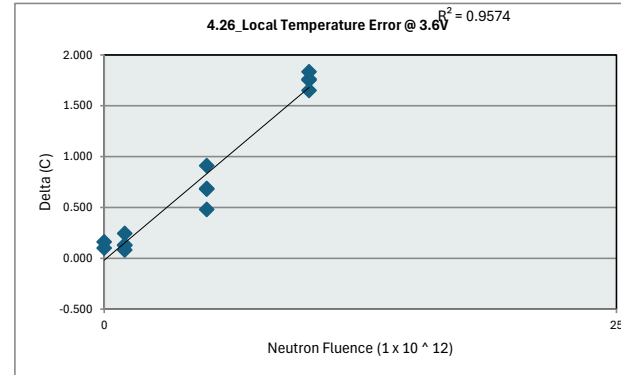
4.18_Remote Error Hot @ 1.7V				
Test Site	J2S			
Tester	FETS36405			
Test Number	EE131305			
Max Limit	1.5	C		
Min Limit	-1.5	C		
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-1.500	-1.500	-1.500	-1.500
Min	-0.037	-0.269	-0.353	-0.692
Average	-0.002	-0.117	-0.286	-0.559
Max	0.032	-0.045	-0.230	-0.473
UL	1.500	1.500	1.500	1.500



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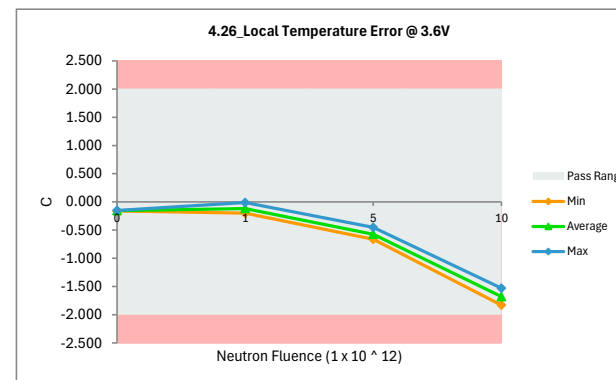
4.26_Local Temperature Error @		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	2	2
Min Limit	-2	-2

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	0.071	-0.011	0.082
1	2	0.065	-0.066	0.131
1	3	0.049	-0.195	0.244
1	4	-0.073	-0.201	0.128
5	5	0.028	-0.453	0.480
5	6	0.249	-0.662	0.911
5	7	0.068	-0.618	0.687
5	8	0.122	-0.558	0.680
10	9	0.176	-1.659	1.836
10	10	-0.068	-1.831	1.763
10	11	-0.046	-1.698	1.652
10	12	0.225	-1.530	1.754
0	192	-0.052	-0.154	0.102
0	193	0.002	-0.160	0.162
Max		0.249	-0.011	1.836
Average		0.058	-0.700	0.758
Min		-0.073	-1.831	0.082
Std Dev		0.105	0.676	0.700



4.26_Local Temperature Error		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	2	C
Min Limit	-2	C

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-2.000	-2.000	-2.000	-2.000
Min	-0.160	-0.201	-0.662	-1.831
Average	-0.157	-0.118	-0.573	-1.679
Max	-0.154	-0.011	-0.453	-1.530
UL	2.000	2.000	2.000	2.000

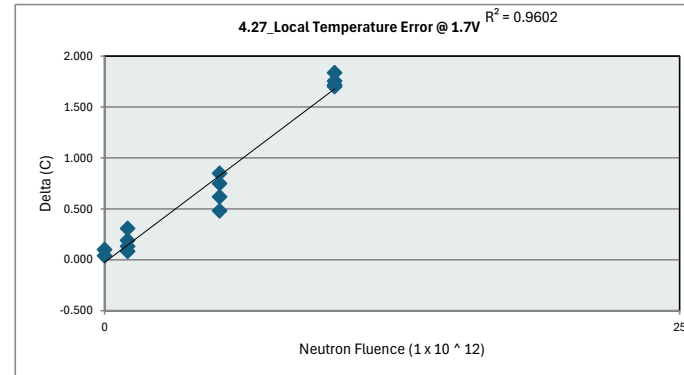


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4.27_Local Temperature Error @

Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C	C
Max Limit	2	2
Min Limit	-2	-2

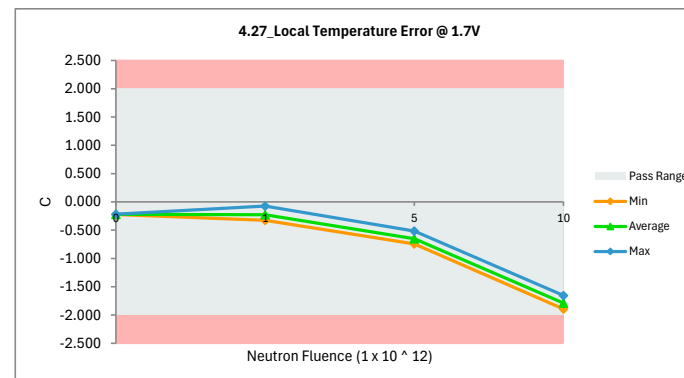
Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	0.008	-0.074	0.082
1	2	-0.060	-0.191	0.131
1	3	-0.014	-0.320	0.307
1	4	-0.135	-0.326	0.191
5	5	-0.035	-0.515	0.480
5	6	0.124	-0.724	0.848
5	7	0.006	-0.743	0.749
5	8	-0.003	-0.621	0.618
10	9	0.051	-1.784	1.836
10	10	-0.193	-1.893	1.700
10	11	-0.108	-1.823	1.715
10	12	0.100	-1.655	1.754
0	192	-0.176	-0.216	0.040
0	193	-0.123	-0.223	0.100
Max		0.124	-0.074	1.836
Average		-0.040	-0.793	0.754
Min		-0.193	-1.893	0.040
Std Dev		0.098	0.684	0.701



4.27_Local Temperature Error @

Test Site	J2S
Tester	FETS36405
Test Number	EE131305
Max Limit	2 C
Min Limit	-2 C

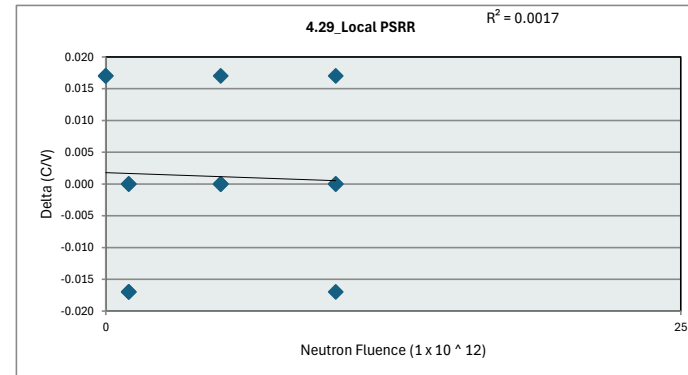
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-2.000	-2.000	-2.000	-2.000
Min	-0.223	-0.326	-0.743	-1.893
Average	-0.219	-0.228	-0.651	-1.789
Max	-0.216	-0.074	-0.515	-1.655
UL	2.000	2.000	2.000	2.000



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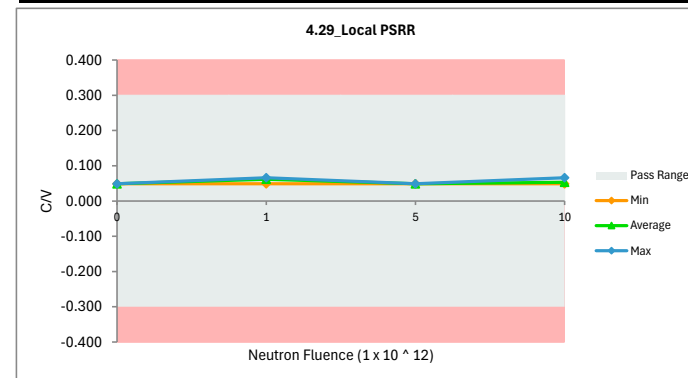
4.29_Local PSRR		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	C/V	C/V
Max Limit	0.3	0.3
Min Limit	-0.3	-0.3

Neutron Fluence (1 x 10 ^ 12)	Serial #	nnd pre	NDD Post	Delta
1	1	0.049	0.049	0.000
1	2	0.066	0.066	0.000
1	3	0.049	0.066	-0.017
1	4	0.049	0.066	-0.017
5	5	0.049	0.049	0.000
5	6	0.066	0.049	0.017
5	7	0.049	0.049	0.000
5	8	0.049	0.049	0.000
10	9	0.066	0.049	0.017
10	10	0.049	0.049	0.000
10	11	0.049	0.066	-0.017
10	12	0.049	0.049	0.000
0	192	0.066	0.049	0.017
0	193	0.066	0.049	0.017
Max		0.066	0.066	0.017
Average		0.055	0.054	0.001
Min		0.049	0.049	-0.017
Std Dev		0.008	0.008	0.012



4.29_Local PSRR		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	0.3	C/V
Min Limit	-0.3	C/V

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-0.300	-0.300	-0.300	-0.300
Min	0.049	0.049	0.049	0.049
Average	0.049	0.062	0.049	0.053
Max	0.049	0.066	0.049	0.066
UL	0.300	0.300	0.300	0.300



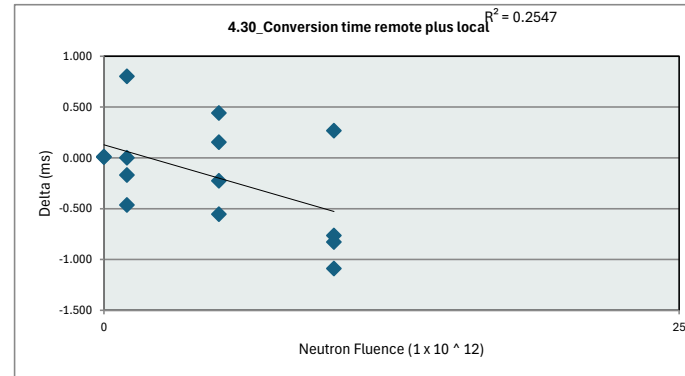
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4.30_Conversion time remote plus local

Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	ms	ms
Max Limit	34	34
Min Limit	28	28

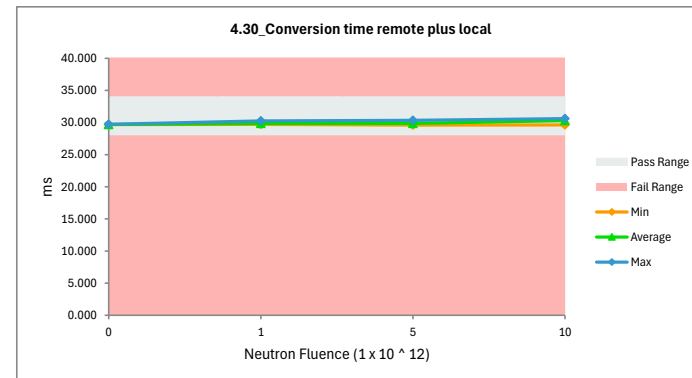
Neutron Fluence (1 x 10 ^ 12)	Serial #	nnd pre	NDD Post	Delta
1	1	29.780	30.243	-0.463
1	2	29.542	29.710	-0.168
1	3	29.717	29.716	0.001
1	4	30.579	29.776	0.803
5	5	30.048	29.606	0.442
5	6	29.796	30.350	-0.554
5	7	29.480	29.704	-0.224
5	8	30.019	29.865	0.154
10	9	29.726	30.553	-0.827
10	10	29.523	30.611	-1.088
10	11	29.676	30.440	-0.764
10	12	29.887	29.619	0.268
0	192	29.687	29.674	0.013
0	193	29.736	29.729	0.007
Max		30.579	30.611	0.803
Average		29.800	29.971	-0.171
Min		29.480	29.606	-1.088
Std Dev		0.279	0.377	0.524



4.30_Conversion time remote plus local

Test Site	J2S
Tester	FETS36405
Test Number	EE131305
Max Limit	34 ms
Min Limit	28 ms

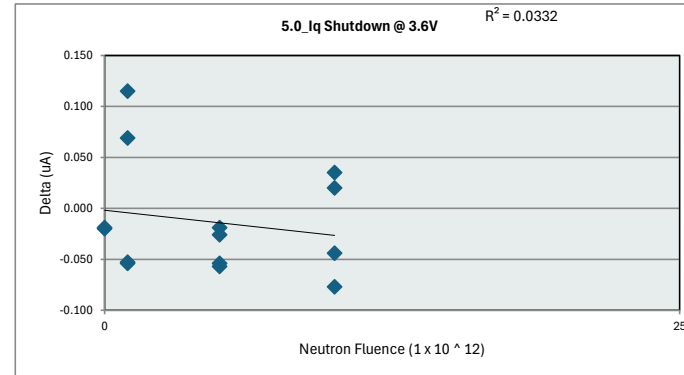
Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	28.000	28.000	28.000	28.000
Min	29.674	29.710	29.606	29.619
Average	29.702	29.861	29.881	30.306
Max	29.729	30.243	30.350	30.611
UL	34.000	34.000	34.000	34.000



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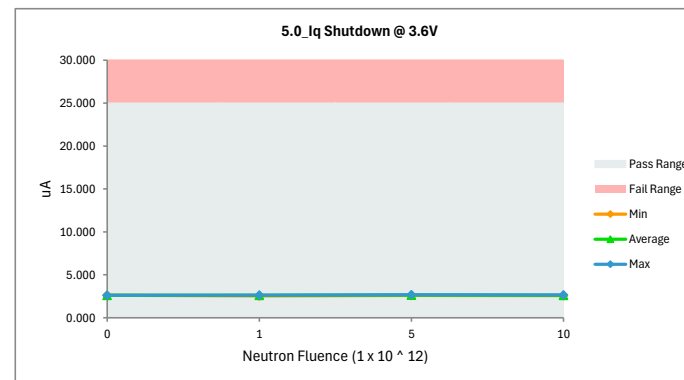
5.0_Iq Shutdown @ 3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	25	25
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	2.654	2.539	0.115
1	2	2.594	2.647	-0.053
1	3	2.580	2.634	-0.054
1	4	2.709	2.640	0.069
5	5	2.605	2.662	-0.057
5	6	2.625	2.679	-0.054
5	7	2.614	2.633	-0.019
5	8	2.575	2.601	-0.026
10	9	2.576	2.653	-0.077
10	10	2.609	2.574	0.035
10	11	2.645	2.625	0.020
10	12	2.581	2.625	-0.044
0	192	2.598	2.618	-0.020
0	193	2.606	2.625	-0.019
Max		2.709	2.679	0.115
Average		2.612	2.625	-0.013
Min		2.575	2.539	-0.077
Std Dev		0.037	0.036	0.055



5.0_Iq Shutdown @ 3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	25	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	2.618	2.539	2.601	2.574
Average	2.622	2.615	2.644	2.619
Max	2.625	2.647	2.679	2.653
UL	25.000	25.000	25.000	25.000

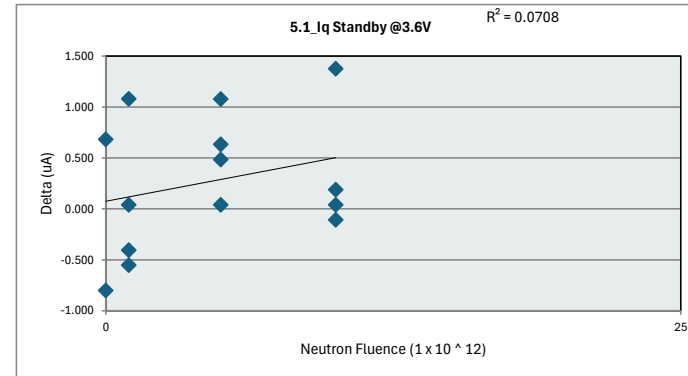


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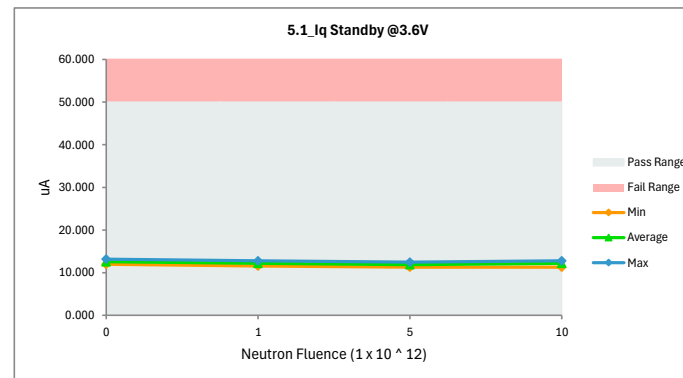
5.1_Iq Standby @3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	50	50
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	12.657	11.577	1.080
1	2	12.063	12.022	0.041
1	3	11.915	12.467	-0.552
1	4	12.360	12.764	-0.404
5	5	12.953	11.874	1.079
5	6	11.322	11.281	0.041
5	7	12.360	11.874	0.486
5	8	13.102	12.467	0.635
10	9	12.805	12.616	0.189
10	10	13.398	12.022	1.376
10	11	11.322	11.281	0.041
10	12	12.657	12.764	-0.107
0	192	12.657	11.974	0.683
0	193	12.360	13.160	-0.800
Max		13.398	13.160	1.376
Average		12.424	12.153	0.271
Min		11.322	11.281	-0.800
Std Dev		0.609	0.572	0.648



5.1_Iq Standby @3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	50	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	11.974	11.577	11.281	11.281
Average	12.567	12.208	11.874	12.171
Max	13.160	12.764	12.467	12.764
UL	50.000	50.000	50.000	50.000

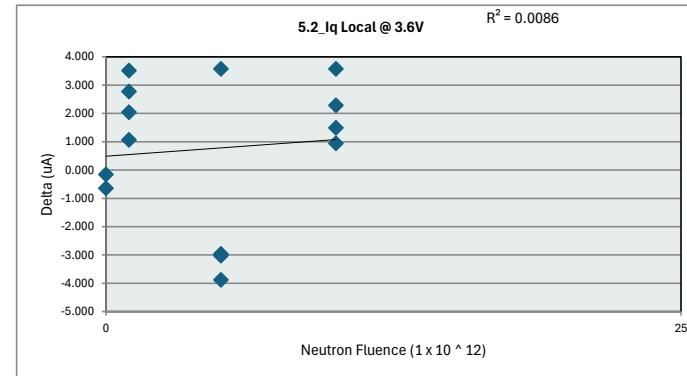


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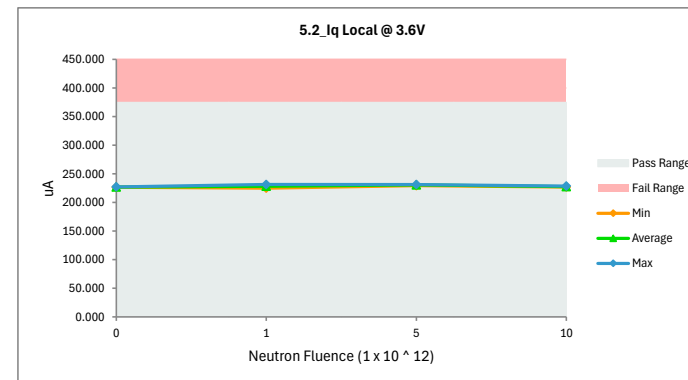
5.2_Iq Local @ 3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	375	375
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	229.602	228.534	1.068
1	2	229.602	227.557	2.045
1	3	228.441	224.930	3.511
1	4	234.183	231.406	2.777
5	5	227.097	230.978	-3.881
5	6	232.900	229.328	3.572
5	7	227.891	230.917	-3.026
5	8	228.136	231.100	-2.964
10	9	229.846	227.557	2.289
10	10	231.984	228.412	3.572
10	11	228.624	227.129	1.495
10	12	227.830	226.885	0.945
0	192	225.936	226.579	-0.643
0	193	226.914	227.068	-0.154
Max		234.183	231.406	3.572
Average		229.213	228.456	0.758
Min		225.936	224.930	-3.881
Std Dev		2.369	2.012	2.552



5.2_Iq Local @ 3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	375	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	226.579	224.930	229.328	226.885
Average	226.824	228.107	230.581	227.496
Max	227.068	231.406	231.100	228.412
UL	375.000	375.000	375.000	375.000

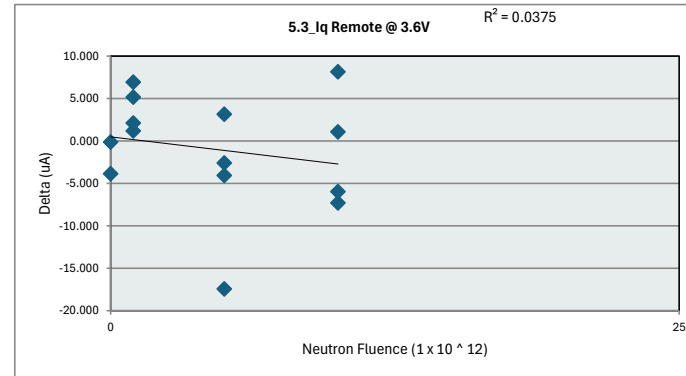


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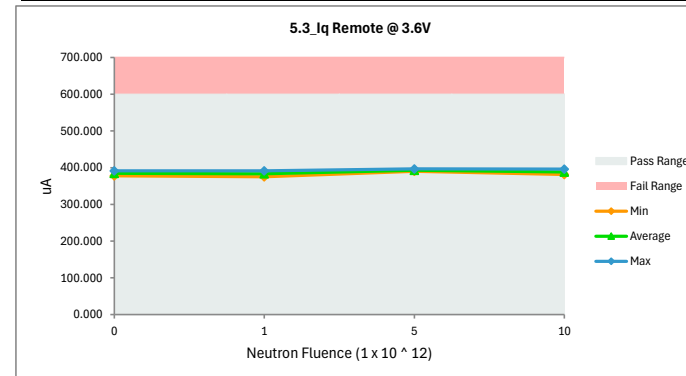
5.3_Iq Remote @ 3.6V		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	uA	uA
Max Limit	600	600
Min Limit	0	0

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	386.228	385.047	1.181
1	2	386.655	381.504	5.151
1	3	382.135	375.212	6.923
1	4	393.558	391.462	2.096
5	5	390.076	392.683	-2.607
5	6	395.574	392.439	3.135
5	7	386.045	390.118	-4.073
5	8	379.325	396.776	-17.451
10	9	382.868	388.835	-5.967
10	10	389.710	381.565	8.145
10	11	388.610	387.552	1.058
10	12	388.671	395.982	-7.311
0	192	387.511	391.377	-3.866
0	193	377.859	378.001	-0.142
Max		395.574	396.776	8.145
Average		386.773	387.754	-0.981
Min		377.859	375.212	-17.451
Std Dev		4.985	6.599	6.657



5.3_Iq Remote @ 3.6V		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	600	uA
Min Limit	0	uA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	0.000	0.000	0.000	0.000
Min	378.001	375.212	390.118	381.565
Average	384.689	383.306	393.004	388.484
Max	391.377	391.462	396.776	395.982
UL	600.000	600.000	600.000	600.000

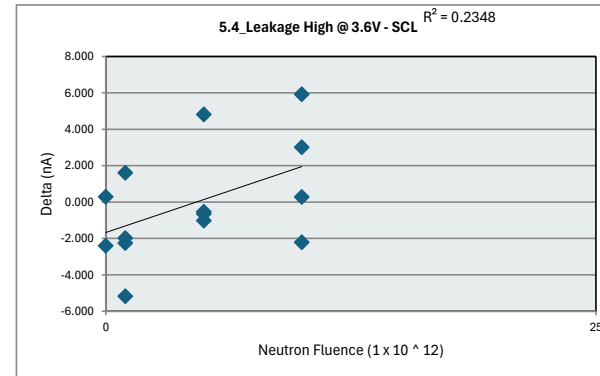


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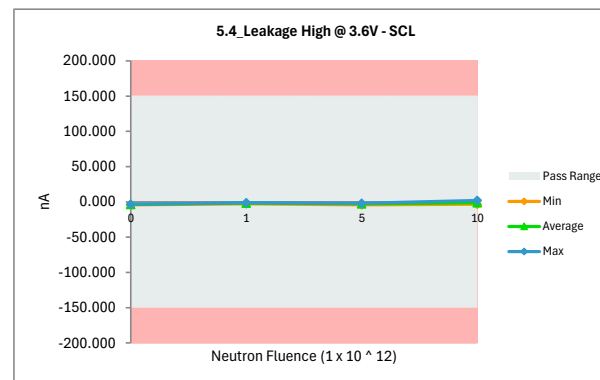
5.4_Leakage High @ 3.6V - SCL		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	nA	nA
Max Limit	150	150
Min Limit	-150	-150

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-3.347	-1.375	-1.972
1	2	-1.161	-2.774	1.613
1	3	-3.741	-1.491	-2.250
1	4	-6.234	-1.068	-5.166
5	5	-3.333	-2.322	-1.011
5	6	-2.910	-2.381	-0.529
5	7	0.661	-4.160	4.821
5	8	-2.750	-2.104	-0.646
10	9	2.658	-3.270	5.928
10	10	-1.001	-1.287	0.286
10	11	-0.155	2.052	-2.207
10	12	0.778	-2.235	3.013
0	192	-3.828	-4.125	0.297
0	193	-5.665	-3.271	-2.394
Max		2.658	2.052	5.928
Average		-2.145	-2.129	-0.016
Min		-6.234	-4.160	-5.166
Std Dev		2.542	1.557	3.015



5.4_Leakage High @ 3.6V - SCL		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	150	nA
Min Limit	-150	nA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-150.000	-150.000	-150.000	-150.000
Min	-4.125	-2.774	-4.160	-3.270
Average	-3.698	-1.677	-2.742	-1.185
Max	-3.271	-1.068	-2.104	2.052
UL	150.000	150.000	150.000	150.000

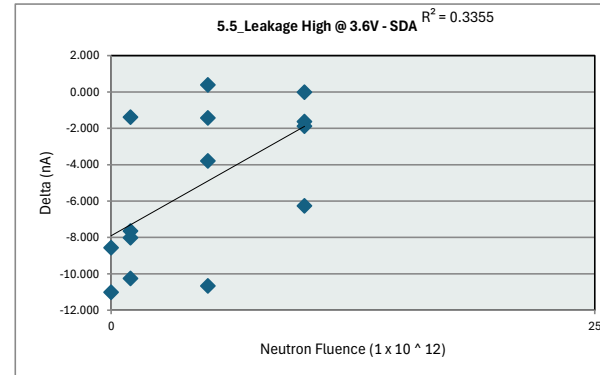


NDD Report

TMP9R01-SP

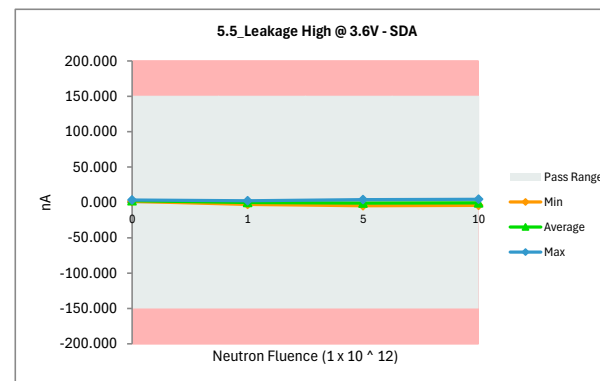
5.5_Leakage High @ 3.6V - SDA		
Test Site	J2S	J2S
Tester	FETS36405	FETS36405
Test Number	EE131305	EE131305
Unit	nA	nA
Max Limit	150	150
Min Limit	-150	-150

Neutron Fluence (1 x 10 ^ 12)	Serial #	ndd pre	NDD Post	Delta
1	1	-7.935	2.315	-10.250
1	2	-4.288	-2.906	-1.382
1	3	-8.243	-0.597	-7.646
1	4	-7.817	0.197	-8.014
5	5	-6.626	4.036	-10.662
5	6	-4.376	-4.759	0.383
5	7	-2.567	-1.141	-1.426
5	8	-5.994	-2.200	-3.794
10	9	-2.097	-0.465	-1.632
10	10	-6.199	-4.318	-1.881
10	11	-1.862	4.403	-6.265
10	12	-2.685	-2.671	-0.014
0	192	-7.155	1.414	-8.569
0	193	-7.640	3.376	-11.016
Max		-1.862	4.403	0.383
Average		-5.392	-0.237	-5.155
Min		-8.243	-4.759	-11.016
Std Dev		2.354	3.003	4.189



5.5_Leakage High @ 3.6V - SDA		
Test Site	J2S	
Tester	FETS36405	
Test Number	EE131305	
Max Limit	150	nA
Min Limit	-150	nA

Neutron Fluence (1 x 10 ^ 12)	0	1	5	10
LL	-150.000	-150.000	-150.000	-150.000
Min	1.414	-2.906	-4.759	-4.318
Average	2.395	-0.248	-1.016	-0.763
Max	3.376	2.315	4.036	4.403
UL	150.000	150.000	150.000	150.000



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Last updated 10/2025